

WE CLAIM AS OUR INVENTION:

1. A medical apparatus comprising:

a data processor in which an image dataset of a body of a subject is stored, said subject containing a bone fragment and said bone fragment being represented in said image dataset;

a display connected to said data processor for displaying an image, obtained from said image dataset, said image containing a visualization of said bone fragment;

an image computer connected to said data processor for segmenting said visualization of said bone fragment in said image on said display;

a medical instrument adapted for introduction into the body of the subject and adapted to interact with said bone fragment in the body of the subject to move said bone fragment;

a navigation system which determines a position of the medical instrument relative to the body of the subject while said bone fragment is being moved with said medical instrument, and generating medical instrument position data representing said position; and

said data processor being connected to said navigation system and being supplied with said medical instrument position data and determining, from said medical instrument position data, a modified position of the bone fragment relative to the body of the subject, and causing a segmented visualization of said bone fragment to be displayed in said image on said display in conformity with said modified position.

2. A medical apparatus as claimed in claim 1 comprising an X-ray apparatus for producing said image dataset.

3. A medical apparatus as claimed in claim 2 wherein said X-ray apparatus generates a volume dataset as said image dataset.

4. A medical apparatus as claimed in claim 2 wherein said X-ray apparatus produces a plurality of two-dimensional projection images forming said image dataset.

5. A medical apparatus as claimed in claim 2 wherein said X-ray apparatus is a C-arm X-ray apparatus having a movable C-arm, and wherein said C-arm X-ray apparatus generates said dataset, by moving said C-arm, intra-operatively while said bone fragment is being moved by said instrument, and wherein data representing a position of said C-arm are generated and supplied to said data processor.

6. A medical apparatus as claimed in claim 1 comprising a reference element adapted for arrangement at said subject, said reference element being detectable by said navigation system and said navigation system generating data representing said position of said reference element together with said medical instrument position data while said bone fragment is being moved by said medical instrument.

7. A medical apparatus as claimed in claim 1 wherein said navigation system generates said medical instrument position data intra-operatively while said medical instrument is moving said bone fragment, without a registration.

8. A method for displaying a movable bone fragment disposed in a body of a subject, comprising the steps of:

generating an image dataset of a body of a subject containing a movable bone fragment;

from said image dataset, generating and displaying an image of at least a portion of the body of the subject containing a visualization of said bone fragment;

segmenting said visualization of said bone fragment in said image;

introducing a medical instrument into the body of the subject to move the bone fragment in the body;

using a navigation system, monitoring a position of the medical instrument relative to the body of the subject as said medical instrument is being moved, and generating medical instrument position data; and

using said medical instrument position data, determining a modified position of the bone fragment in the body of the subject and displaying a segmented presentation of said bone fragment in said image in conformity with said modified position.

9. A method as claimed in claim 8 comprising generating said image dataset with an X-ray apparatus.

10. A method as claimed in claim 8 comprising generating a volume dataset as said image dataset.

11. A method as claimed in claim 8 comprising generating a plurality of two-dimensional projection images of the body of the subject as said image dataset.

12. A method as claimed in claim 8 comprising generating said image dataset pre-operatively, before introduction of said medical instrument into the body of the subject.

13. A method as claimed in claim 12 comprising undertaking a registration with said navigation system before beginning monitoring of the position of the medical instrument relative to the body of the subject.

14. A method as claimed in claim 8 comprising generating said image dataset intra-operatively, after introducing the medical instrument into the body of the subject.

15. A method as claimed in claim 14 comprising generating said image dataset using a C-arm X-ray apparatus having a movable C-arm, and simultaneously identifying a position of said C-arm together with monitoring the position of the medical instrument.

16. A method as claimed in claim 14 comprising arranging a reference element, detectable by said navigation system, at said subject and simultaneously monitoring a position of the subject together with monitoring the position of the medical instrument.

17. A method as claimed in claim 14 comprising, with said navigation system, monitoring the position of the medical instrument without a previous registration.